

### **REMARKS**

The non-final Office Action was issued on pending claims 1-11. Claims 1, 4, 8-11 stand rejected. Claims 2, 3, and 5-7 have been withdrawn from consideration as being directed to a non-elected invention. In this Response, no claims have been amended, added or cancelled. Thus, claims 1-11 are pending in the application, and claims 1, 4 and 8-11 are under consideration.

### **Claim Rejections – 35 USC § 103**

In Office Action paragraph 1, claims 1, 4 and 8-11 were rejected under 35 USC § 103(a) as being unpatentable over Ko (US 5,528,452) in view of Tapani (EP 0 727 650). Applicants respectfully disagree.

Claim 1 pertains to a pressure sensor and calls for the concentration of an impurity at the top face of the diaphragm to be equal to or greater than  $1 \times 10^{19} \text{ cm}^{-3}$  and less than  $9 \times 10^{19} \text{ cm}^{-3}$ . Claim 4 also pertains to a pressure sensor and calls for the etch pit density on the top face of the diaphragm being equal to or less than five per  $\mu\text{m}^2$ .

The Office Action acknowledges that Ko does not disclose Applicants' claimed concentration of an impurity at the top face of the diaphragm being equal to or greater than  $1 \times 10^{19} \text{ cm}^{-3}$  and less than  $9 \times 10^{19} \text{ cm}^{-3}$ . The Office Action also acknowledges that Ko does not disclose an etch pit density on the top face of the diaphragm being equal to or less than five per  $\mu\text{m}^2$ .

Turning to Tapani, Applicants submit that Tapani also does not disclose or suggest all of the features of claims 1 and 4, particularly the features in claims 1 and 4 mentioned above. Tapani merely discloses an ion implantation of boron onto polysilicone thin layers 3, 5 and 7 so as to form electrodes. See Tapani, column 4, lines 30-38; Fig. 2. Tapani is silent on the concentration of boron. Additionally, the openings 12 in Tapani (see Figs. 1 and 2) are not etch pits, but rather, the openings 12 are intentionally formed in diaphragms using a lift-off method or a photoresist. See Tapani, column 3, lines 45-48 and column 4, lines 1-3. Furthermore, the size of the Tapani openings 12 is typically 1 to 100  $\mu\text{m}$ , most typically 1 to 10  $\mu\text{m}$ , as described at column 4, lines 3-5. The Tapani openings 12 have such a large size which is incomparably larger than the size of Applicants' etch pits in which the number thereof per 1  $\mu\text{m}^2$  of the

diaphragm becomes an issue as described in the specification of the present application. An embodiment of Applicants' invention can provide the significant advantage of improvement of durability of the detector by decreasing the etch pit density in the top face of the diaphragm by controlling the concentration of the impurity at the top face of the diaphragm. Moreover, Tapani does not even mention etch pits on the surface of the diaphragm and influences thereof. Therefore, claims 1 and 4 of the present application are not disclosed or suggested by Tapani.

The Office Action asserts that the feature of claim 1 of the present application that the concentration of the impurity (boron) at the top face of diaphragm is equal to or greater than  $1 \times 10^{19} \text{ cm}^{-3}$  is only a modification of the prior art. However, the etch pit density in the top face of the diaphragm is critically changed (reduced) at the range of the concentration of boron is  $1 \times 10^{19} \text{ cm}^{-3}$  to  $9 \times 10^{19} \text{ cm}^{-3}$ , as shown in the attached REFERENCE FIGURE which shows a relationship between the number of etch pits in the top face of the diaphragm and the concentration of the boron in the diaphragm. The REFERENCE FIGURE was obtained as a result of an inspection to the pressure sensors performed by the applicant in accordance with the examples in the specification of the present application. In the REFERENCE FIGURE, two photographs show the condition of the top face of the diaphragm (size:  $1 \mu\text{m}^2$ ) by an atomic force microscope, AFM. Furthermore, as a result of a pressure durability test which was performed on the pressure sensors, breakage of the diaphragm was observed in the pressure sensors having etch pits in the top face of the diaphragm.

As described above, it is clear that unexpected advantages are obtained by setting the range of the concentration of the impurity to that of Applicants' claim 1. Therefore, the range of the concentration of the impurity claimed in claim 1 is not a mere optimization or modification of the prior art.

Applicants also submit that there is no motivation, teaching or suggestion to combine Ko and Tapani to achieve Applicants' claimed invention.


Thus, Applicants submit that the §103 rejections should be withdrawn.

**CONCLUSION**

For the foregoing reasons, Applicants submit that the patent application is in condition for allowance and request a Notice of Allowance be issued.

Respectfully submitted,

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